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Life Cycle Earnings and Wage Premiums

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preliminary paper

ABSTRACT

In this paper I use the Malmö Longitudinal Study and construct actual age-earnings profiles for the 1928 cohort of Malmö men. Real earnings for the highest educated men are found to have decreased significantly during the late 70s and early 80s. The emerging age-earnings profiles are rather similar to the approximated profiles by Mincer (1974). The same development is found for the wage premiums over the life-cycle. A similar pattern has been found in other Swedish studies, but then from cross-sectional data. A significant difference is found between the wage premiums for vocational and lower secondary school, even though they involve the same number of years in education. Finally, ability is introduced in the model, and a proportionally much larger ability bias is found for the lower levels of education. This is explained with the larger spread of ability in the lower educational groups.

I – Introduction

Studies on earnings differences over the working life for people with different levels of education have in general been limited to cross-sectional census data. The respondents have then been divided into age groups, and the earnings converted into time series profiles by adjusting for secular growth in incomes. Hence, the data do not show how individuals' incomes differ as they grow older, but rather how incomes differ between age groups on a given occasion, or would develop over the lifetime in a stationary economy. (Becker, 1993; Mincer, 1974; Willis, 1986) More recently, longitudinal cohort analyses have revealed that cross-sectional studies give a biased picture of how wage premiums develop over time. (Creedy, 1991; Heckman et al., 2003)

The Malmö Longitudinal Study includes data on earnings for the 1928 cohort of men and women in Malmö, from the age of twenty to the age of sixty-five – the normal retirement age in Sweden. Hence, this material gives an almost complete picture of life-cycle earnings for a number of people. Of course, time dependent phenomena, such as business cycles, institutional factors, or employment changes, will affect the profiles. In this paper I show how earnings and wage premiums have developed for the respondents in the Malmö Study.

It is widely accepted that earnings increase with formal schooling. Opinions, however, differ about the magnitude of the wage premiums and the factors behind them. Several explanations have been offered (Becker, 1993; Mincer, 1974; Arrow, 1973; Spence, 1974; Willis, 1986). Traditional human capital theory assumes that persons originally have more or less the same abilities, and then become more productive with schooling, and therefore earn higher wages to compensate for the extra time spent in education. Signalling theory, on the other hand, assumes that education signals original talent; since more able persons tend to attain higher levels of education, the employers assume that the more educated are more productive. Furthermore, the educational level is also often strongly correlated with family background, and it may be the case that the employer wishes to recruit someone with a particular set of characteristics given by his/her background and education. It has been shown

in a number of studies (Griliches, 1977; Blackburn & Neumark, 1991; Lam & Schoeni, 1993; Mellander, 1998) that when background factors, which are positively correlated with the educational level, are not included in the wage regression, the wage premium for schooling tends to be positively biased – *the omitted variable bias*. On the other hand, if the schooling variable is not correctly defined/collected, the wage premium tends to be negatively biased instead – *the measurement error bias*. Hence, it is difficult to know if the schooling coefficient in the end is positively or negatively biased.

This paper is organized as follows. In the next section I present my data, and the model I use. Thereafter I present the results on how earnings differ with time and age for my cohort, and in the next part how the wage premium develops with time. Then I include ability in the model and take a closer look at the ability biases over the years. Finally, in the last section I discuss the results.

I distinguish between the rate of return on schooling and the wage premium for schooling. The rate of return on schooling is supposed to tell to what degree schooling is profitable over a lifetime, while the wage premium tells how much the schooling is remunerated at one point in time, other factors held constant. To calculate the former it is necessary to have information on all costs and revenues involved in schooling at different points in time. To calculate the latter, the wage premium, it is sufficient to know about income and schooling, and some other variables of control, for different individuals at one certain point in time. (Mellander, 2002) This paper concerns the wage premium for schooling.

II - The data and the model used

I use the Malmö Longitudinal Study, which is one of the longest individual longitudinal databases existing. A doctoral student in Lund named Siver Hallgren initiated the study in 1938, and collected information on all third-graders in the province of Malmö. An ability test was distributed and converted into intelligence quotas, and background information collected, such as social class, father's education and profession, parents' income, number of siblings, et.c. In 1964, data on each student's acquired level of education was collected, through a survey but also supplemented with register information. Four surveys have been distributed, 1964, 1971, 1984 and 1994, and from them there is data on, among other things, profession and work experience, unemployment or retirement. Furthermore, data on earnings has been collected through registers at fourteen points in time from 1948 to 1993. The original number of individuals was 1542, and of them 275 were no longer alive in 1993. Earnings were reported for 1237 of the 1267 possible individuals (98%) in 1993, and the survey in 1994 was replied to by 955 individuals (75%). There is a vast amount of information in the Malmö study, but in this study I only use the following variables: educational level, occupational category, sex, earnings, ability and social class.

Educational level was reported in six different categories: discontinued primary school; primary school; vocational school; lower secondary school; upper secondary school and, university. Primary school ('folkskola') was at this

time seven years in the province of Malmö. Vocational school was often one or two years after primary or secondary school. Lower secondary school ('realskola') was begun after four, five or six years of primary school, and lasted for four or five years. Compared with vocational school, lower secondary school was a more theoretical continuation of primary school. Upper secondary school was three or four years. I have constructed dummy variables for the levels of schooling acquired, allowing the two lowest levels (discontinued and completed primary school) to form the reference group. There are two reasons for this: firstly, discontinued primary school can be anything less than seven years and is therefore difficult to use as a reference. Secondly, when I tried these levels separately, the differences regarding earnings between the two groups were negligible.

There is register data on earnings for the years 1948, 1953, 1958, 1963, 1968, 1969, 1971, 1978, 1980, 1982, 1984, 1986, 1991, and 1993. Unfortunately, the originally collected earnings data were assessed incomes, net of tax reductions. From the seventies and onwards this amount could be quite different from the actual earnings, due to changed tax legislation. I have therefore supplemented the material with gross income data from Statistics Sweden for the following years: 1968, 1971, 1974, 1978, 1982, 1986, 1990, and 1993. I will use the originally collected earnings data until 1968, and thereafter gross income data from Statistics Sweden. I can compare earnings from both sources for 1968 and 1971, and they are almost exactly the same for most individuals. For the year 1968 I use the original data, because that dataset contains more individuals. Earnings are yearly and hence, they do not tell if the person in question has worked full- or part-time, or maybe only part of the year. To come to terms with this problem I have checked wage-statistics for the relevant years, and excluded those persons I believe earned too little to have worked full-time.[1]

The data does not tell if the earnings are acquired through gainful work, or if pensions or other kind of subsidies have been received. Through the occupational data given in the surveys I can, however, figure this out for most of the individuals. From the surveys there is information on each individual's profession from 1942 till 1993, and this information is translated into work experience where the individual receives one year of experience for the years he has reported an occupational category, and not otherwise. For individuals who have not answered the surveys there is unfortunately no data on possible work experience. I have therefore constructed dummies to take this into consideration. Social class of the family in 1938 was assigned to one of four categories on the basis of four items of information: father's occupation, 1937 family income, number of children at home and if the family appeared in the social welfare registers of the Malmö schools. I use a dummy for the highest social class. I use the standard Mincer (1974) semi-logarithmic equation, but with a dummy for each educational level:

[1] I have excluded those who earned less than:

for 1948 - 4.000 SEK	for 1953 - 5.000 SEK	for 1958 – 7.000 SEK
for 1963 - 8.000 SEK	for 1968 - 10.000 SEK	for 1971 - 12.000 SEK
for 1974 - 15.000 SEK	for 1978 - 22.000 SEK	for 1982 - 30.000 SEK
for 1986 - 43.000 SEK	for 1990 - 55.000 SEK	for 1993 - 65.000 SEK

$$\ln Y_{it} = \alpha_t + \beta_{3t} S_{3i} + \beta_{4t} S_{4i} + \beta_{5t} S_{5i} + \beta_{6t} S_{6i} + \lambda_t X_{it} + \delta_t X_{it}^2 + \rho_t Q_{it} + \zeta_t Z_i + e_{it} \quad (1)$$

where $S_3 = 1$ if acquired schooling level is vocational, and
0 otherwise,
$S_4 = 1$ if acquired schooling level is lower secondary, and
0 otherwise,
$S_5 = 1$ if acquired schooling level is upper secondary, and
0 otherwise,
$S_6 = 1$ if acquired schooling level is university studies, and
0 otherwise

Schooling levels are compared with discontinued or fulfilled primary school, seven years at most. Given the four dummies, the wage premium is not assumed to be the same for all schooling levels, but might differ with each level. On the left hand side, $\ln Y_{it}$ gives the logarithm of the yearly earnings, where *i* is each individual's index and *t* tells which year is used. The individual's total years of work experience for the year in question (*t*) is given by X_{it} and X_{it}^2. *Q* is the dummy for those without any information on work experience in year *t*,[2] and *Z* a dummy for social class.

I study only men in this paper; since I do not have reliable information on full- or part-time work, it is difficult to interpret the women's data in a comparison with the men.

I exclude all individuals without information on acquired schooling level, and also three outliers with more than three times as high earnings as the average. Originally the cohort consisted of 834 men, and the educational level is missing for 79 of them. I allow the program to use all individuals with earnings (of at least the levels given earlier) reported for each year tried; hence the number of individuals included in the regressions varies from 186 (1948) to 675 (1974).[3] The differences between the original sample and the slightly reduced sample of 752 men I use are rather small. The original sample has somewhat higher

[2] Since experience is a variable constructed from data in the surveys, which are from four different occasions, several dummies have to be used for the later years to handle the fact that *X* is supposed to give the accumulated work experience.

[3] I have also tried the model on a smaller sample which consists of exactly the same men each year; that is, including only those with earnings reported each year in question from 1958 and onwards. I did not exclude those without reported earnings for 1948 or 1953, nor did I try this smaller sample these years, since many of the academically educated had at the time not yet entered the labour market. The difference between the premiums for the two samples was rather small; except for the estimates for the academically educated the differences are in fact negligible. However, since the number of persons with academic education in the smaller sample is very small (ten individuals) I choose not to go deeper into this. A figure of these estimates is given in Appendix F1, to be compared with Figure 4.

values for all variables and I cannot find a good explanation for this. The only obvious characteristic in common for the group of individuals with missing information on education, is that they include some of those, but not all, who did not answer the survey in 1964, and whose educational information was not available through national registers. (The information on educational level is constructed from this survey, but supplemented with register information). See Table 1.

The Malmö Study has its strengths and its weaknesses. Among its strengths are, for example, the unusually long period of time over which these individuals are followed – from ten years of age till retirement age. Another strength is the vast amount of variables included, which makes it possible to control for a lot of factors. Furthermore, the early age at which the ability measure is collected is of high value since the individuals probably had not yet been too affected by their surroundings, and the Swedish educational system had not yet allowed any diversification among the pupils. One weakness, which makes the material a little complicated to handle, is that the data is a mixture of information collected at the start of the study, through registers, and through surveys at four different points in time. Therefore, the availability of information is sometimes slightly irregular. With time more of the original individuals were found, since the methods to find those who left the southern region of Sweden were improved. This, and the inclination to respond among the respondents, has resulted in bigger and smaller gaps regarding foremost the occupational information. This fact is not of any major importance for this study, but makes the years of experience difficult to calculate for some of the men.

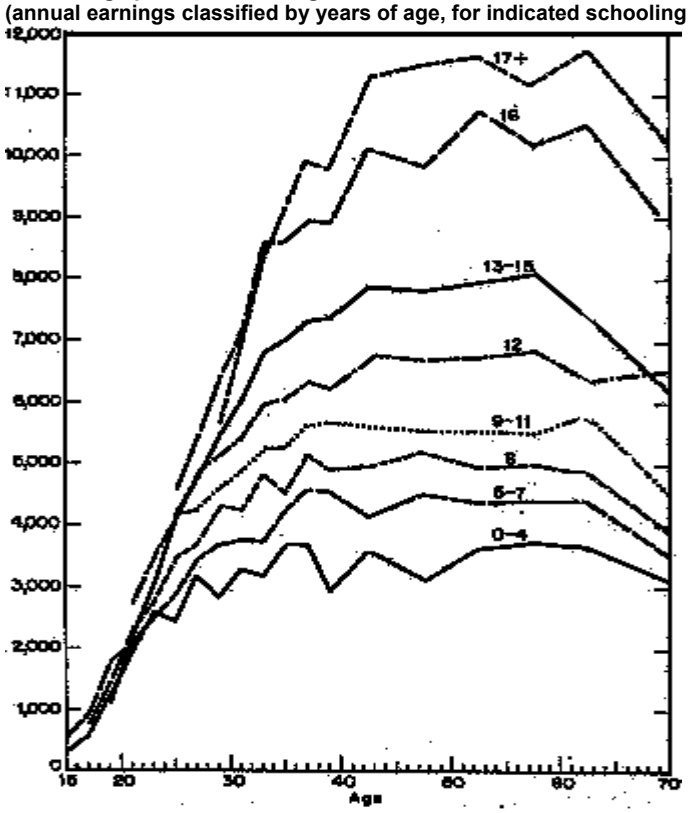
Table 1.
Descriptive statistics
(Std dev. in parentheses)

	Original cohort *n* = 834	Sub-sample *n* = 752
Primary school		0.47 (0.50)
Vocational school		0.26 (0.44)
Lower secondary school		0.12 (0.33)
Upper secondary school		0.09 (0.28)
Academic education		0.06 (0.24)
Social class – high	0.12 (0.32)	0.10 (0.30)
IQ	97.73 (16.02)	97.16 (15.87)
Earnings 1958	13 214 (6893)	13 109 (6850)
Earnings 1963	19 683 (13039)	19 416 (12769)
Earnings 1968	35 010 (26679)	33 863 (20530)
Earnings 1971	40 713 (28280)	40 189 (25004)
Earnings 1974	52 551 (32687)	52 068 (28435)
Earnings 1978	77 440 (44728)	76 264 (41709)
Earnings 1982	107 377 (79331)	103 450 (58652)
Earnings 1986	137 404 (120443)	132 650 (73602)
Earnings 1990	188 863 (137324)	183 918 (119455)
Earnings 1993	202 734 (138614)	196 349 (106972)

III - Earnings over time

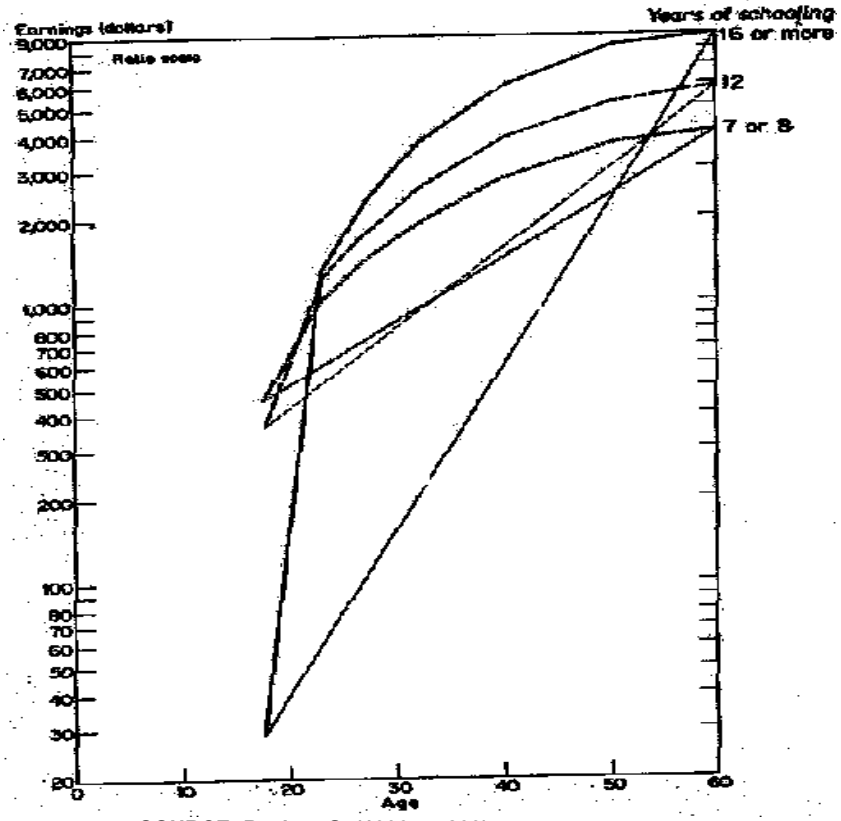
Much has been written on the subject of human capital and the wage premium on education, but less on how earnings and premiums develop with time and age. The Swedish Level of Living Survey (LLS) is the prime source of Swedish empirical data. LLS begun in 1968 and the latest survey was in 2000. However, there is earnings data from as early as 1951. LLS consists of cross-sectional data collected on, so far, five occasions – 1968, 1974, 1981, 1991 and 2000. Björklund (1993) uses earnings data from 1951 to 1989 and compares the actual distributions of annual and lifetime income. Furthermore, a number of studies have estimated the premiums at the survey years, that is, 1968, 1974, 1981 and 1991. In some cases the Swedish Panel Study of Market and Nonmarket Activities (HUS) has also been used. (Björklund, 1999; Edin & Holmlund, 1993; Björklund & Kjellström, 2002) Internationally Jacob Mincer (1974) and Gary Becker (1993) have been the pioneers in lifecycle analyses using cross-sectional data (U.S. Census, 1940 and 1960). The estimated profiles are fairly similar; the higher educational levels have a steeper curve and a later peak than the lower educational groups. Mincer's curves dip towards the end of the working life, which Becker's do not, see Figure 1 and 2. These figures are the only examples of appreciated lifecycle profiles I have found. I show them here to illustrate what such profiles can be expected to look like, and Mincer's figure will be shown to be quite similar to the actual profile for the men in the Malmö study.

Figure 1.
Age profiles of earnings of white, nonfarm men, 1959
(annual earnings classified by years of age, for indicated schooling group)



NOTE: Figures on curves indicate years of schooling completed.'
SOURCE: 1/1,000 sample of U.S. Census, 1960
Mincer, J. (1974, p.66)

Figure 2.
"Time Series" Age-Earnings profiles for several 1959 education cohorts.



SOURCE: Becker, G. (1993, p. 233)

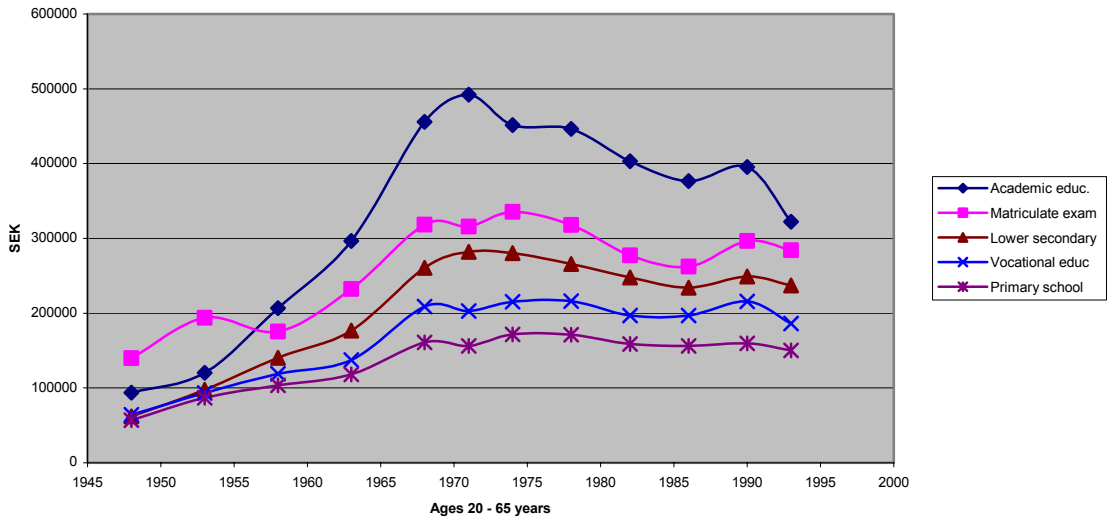
Actual age-earnings profiles for the men in the Malmö Study will now be given, see Figure 3. As a curiosity, profiles for the women are shown in Appendix F2. Since I show actual earnings from 1948 till 1993 some kind of adjustment of the nominal values is necessary. I have chosen to depict earnings in 1993 years value, and have inflated them with the consumer price index for each year used. In this case I have only excluded those without information on educational level, and three outliers.[4] In Figure 3, years of earnings are given. With a few exceptions, the individuals were born in 1928, and hence they were 25 years of age at the first reported year, and 65 at the last reported year.

The men's profiles are fairly comparable with Mincer's (see Figure 1.), even if the peak was reached earlier among the men from Malmö – at approximately 43 or 46 years of age. All the curves dip towards the late seventies and early eighties, but it is above all the academically educated who experienced a significant decrease in their real earnings. For the most educated men the average real earnings dropped with almost 20% between 1971 and 1990. For the other groups the drop was significantly less – for the men with primary or vocational school the earnings levelled off at just over forty years of age, and were from then and onwards fairly stable. The steep decrease between 62 and 65 years of age for the highest educated is rather surprising. However, many of the men had already retired by then; 83% of the 436 men who answered the survey in 1994 reported themselves to be retired in 1993. Furthermore, six

[4] With earnings above 1 MSEK 1993. See Appendix F3 for a figure with these outliers included.

persons were on sick leave, while only two were unemployed. There was also a big tax-reform in Sweden in the early nineties, and the consequences of this reform on earnings are not yet clear.

Figure 3. Age-earnings profiles - men - 1993 years value



From the survey 1984 we know that 76% of the academically educated men were employed within the public sector, compared with only 28% of the men with Upper secondary school. If we assume that those who worked in the public sector in 1984 did so over the whole period, and that those who worked in the private sector also did so over the whole period, this can be part of the explanation. According to a study by Zetterberg (1994) the development of wages has been different in the private and public sector, or even between the state and the local government sector. Unfortunately this distinction is not available in the Malmö material, but only between private and public sector. Zetterberg (1994) found that the development of the premiums have been more favourable in the private than in the public sector during the seventies and the eighties, with the local government sector having the worst development of the three sectors. The wage equalisation policy was also more active within the public sector.

IV – Premiums over time

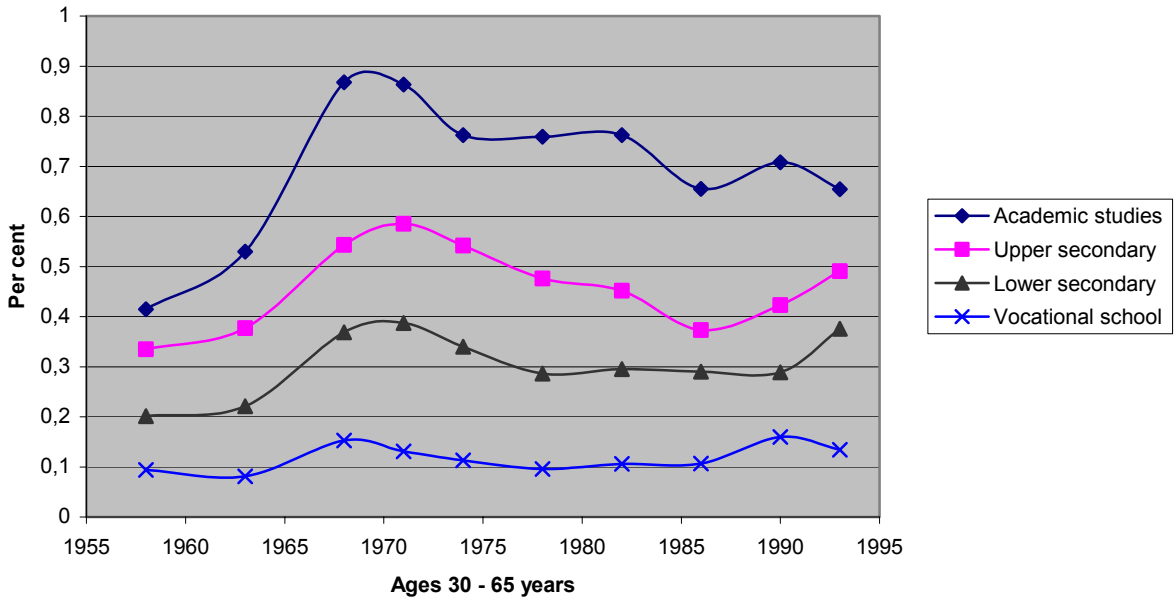
When studying the development of the wage premiums I use Eqn. (1) as given earlier:

$$\ln Y_{it} = \alpha_t + \beta_{3t} S_{3i} + \beta_{4t} S_{4i} + \beta_{5t} S_{5i} + \beta_{6t} S_{6i} + \lambda_t X_{it} + \delta_t X_{it}^2 + \rho_t Q_{it} + \zeta_t Z_i + e_{it} \quad (1)$$

The estimates are without significance until 1953 or 1958 and I have therefore chosen to show the curves only from 1958 and onwards. Figures showing the development of the wage premiums from 1953 till 1993 for the different educational levels are shown in Figure 4. A complete table is found in Appendix T1.

The wage premium reached its peak the years just before or after 1970, and dropped thereafter, more or less depending on educational level. Those with the highest education experienced the largest drop, while those with the lowest education had a relatively constant premium over the whole working life. Hence, the dispersion of earnings between the educational groups was reduced during the seventies and early eighties. This can perhaps be explained by the wage equalisation policy that was very active during this period. Another part of the explanation may be the already mentioned fact that a majority of the highest educated men worked within the public sector while a majority of those with upper secondary school worked within the private sector. The public sector had a worse development of wages during this period of time than the private sector.[5] (Zetterberg, 1994)

Figure 4. Wage premiums



[5] I have tried to compare the results by public and private sector, running separate regressions for the individuals in each sector. However, this gave rather inconclusive results.

A number of studies have shown this large drop in educational premiums in the seventies, but also a tendency of a recovery in the late eighties. (Edin & Holmlund, 1995; Hibbs, 1990; Zetterberg, 1994) The recovery is harder to discern in the Malmö material; the wage premium between 1990 and 1993 tends to develop differently depending on educational level. I have chosen not to delve deeper into these comparisons. The Malmö study consists of a cohort whose members reached retirement age in the early nineties, a fact which probably had a great influence on the premiums for these years, while the LSS is a cross-sectional material consisting of Swedish citizens between 16 and 64 years of age.

The fit of the model (R^2) is strongest for the year when the wage premium is at its highest, and the years closest to it; for 1968 R^2 is 0.44, while it is slightly lower for the years 1963 and 1971. Thereafter it is between 0.25 and 0.37. (A full table is given in Appendix T1.) The estimates for educational level have very high significance each year from 1958 and onwards. In a few cases they are within each other's confidence intervals (95%), especially for the years before 1968. When this happens after 1968 it is only the estimates for lower and upper secondary school that overlap in a few cases.

The estimates for experience are small and insignificant, but with two or three exceptions. This could be because the individuals are all of the same age, and therefore should have approximately the same level of work-experience. Unfortunately I cannot check this on the Malmö material, since the information on possible work-experience is derived from the survey-information and hence not available for all individuals.[6]

Since I have information on retirement age, I have also tried the model with this information included. I constructed a dummy variable to signify retirement each of the years 1982, 1986, 1990 and 1993 – before 1982 almost none had retired. Remember that I already use dummies to tell if there is no occupational information. I use equation (1) and simply add an *R* for the dummy for retirement – the equation otherwise unchanged. The fit increased a little, more for the first years and less for later years. This model yielded the following results, with a **–** or **+** showing if the estimate decreased, increased or remained the same when the dummy was included. All educational estimates are highly significant, and the differences regarding year 1993 are small. The coefficient for retirement is highly significant except for the last year (1993).

[6] When I look closer only on the individuals who have answered all the surveys and given occupational information for all possible years, the spread in degree of work-experience is quite small. However, it is hard to tell how representative this information is of the whole cohort. I also tried the model with interacting variables of education and experience, to see if there might be some effect of experience together with education. This did not give any further information though. The experience variables still turned out insignificant, a few of the interactive variables were significant but difficult to interpret, and the significance of the educational variables was very reduced.

Table 2.
Estimates for a few variables in Equation (2)
(Std deviations in parentheses)

	1982	1986	1990	1993
Retirement dummy	-.716	-.390	-.252	-.069
	(0.118)	(0.095)	(0.045)	(0.054)
Vocational school	0.114 **+**	0.101 **+**	0.120 **-**	0.103 **-**
	(0.030)	(0.032)	(0.041)	(0.039)
Lower secondary school	0.281 **-**	0.283 **-**	0.280 **-**	0.375 **-**
	(0.054)	(0.048)	(0.058)	(0.052)
Upper secondary school	0.445 **-**	0.379 **-**	0.409 **-**	0.521 **-**
	(0.056)	(0.059)	(0.072)	(0.072)
Academic studies	0.735 **-**	0.678 **-**	0.722 **-**	0.698 **-**
	(0.084)	(0.083)	(0.090)	(0.086)

In this paper I have studied the wage premium for different measured levels of education. In many studies – most of them from the U.S. - years of education have been used instead. Considering this it is interesting to note the prominent difference between the premium for those with vocational school and those with lower secondary school as their highest level of education. From 1968 and onwards these estimates are not within each others confidence intervals, and still the number of years in school are fairly equivalent for these groups. Those with vocational school probably spent six or seven years in primary school, and then one or two years in some vocational program, hence between seven and nine years altogether. Those with lower secondary school most often took four years in primary school and then four or five years in secondary school, hence eight or nine years altogether. Thus, it is notable that the difference between these two educational levels is as big as it is; often the estimate for lower secondary school is more than twice as high as for vocational school. See Table T1 in Appendix for exact figures.

V – Ability bias

It is a well-established fact that when ability is included in the model the wage premium for schooling tends to decrease. (Griliches 1976; Griliches 1977; Blackburn & Neumark, 1991) This phenomenon often appears when additional variables, correlated with the educational variable, are included – the omitted variable bias. It is not certain that the bias is positive though, even if this should be the case when the additional variable is ability. This fact, however, tallies with the signalling theory of human capital, interpreted to mean that part of what the employers pay for is the expected higher ability embodied in the well-educated worker. When ability, or a proxy for ability, is not included in the model, this effect will instead partly be captured by the schooling coefficient. The difference in the schooling estimates, with or without ability, is supposed to measure the degree of the ability bias.

In this part I will further develop the model to include also an ability measure. I will use a variable equivalent to each individual's intelligence quota as estimated with help of the ability test distributed in 1938 – at ten years of age. The measure is available for 100 per cent of the men in the study. I continue using the standard Mincer equation as given before (equation (1)), adding an A for ability this time.

When I include ability in my model, the expected result is obtained – the estimates for schooling are reduced. (See Table T2 in Appendix for the full results.) The coefficient for ability is highly significant each year from 1958 and onwards, and has values between 0.002 and 0.005. The schooling coefficients follow almost exactly the same curves as in the original model, but on a slightly lower level. However, the ability bias is consistently proportionally higher for the lower educational categories than the higher, even if the absolute bias is higher for the latter. The estimates are within each other's confidence intervals. In Table 3 the estimates for ability each year is given, as well as the absolute and relative ability bias for year and educational level. For 1963 there is one missing value; the estimates in the model with ability were not significant in this case and I have therefore chosen not to calculate the ability bias.

In his article in 1976 Griliches estimated ability bias for young men in America. He received similar estimates for ability, approximately 0.002 which is also the case for the Malmö men at young age. However, Griliches received a lower proportional bias – around ten percent – which is comparable to what I found for the academically educated men from Malmö.

Table 3.

År	IQ	Educational level	Absolute bias	Percentage bias
1958	0.002	Vocational school	.016	17%
		Lower sec. school	.031	15%
		Upper sec. school	.035	10%
		Academic studies	.042	10%
1963	0.0036			
		Lower sec. school	.058	26%
		Upper sec. school	.071	23%
		Academic studies	.085	16%
1968	0.0033	Vocational school	.030	20%
		Lower sec. school	.055	15%
		Upper sec. school	.067	12%
		Academic studies	.078	9%
1971	0.0039	Vocational school	.040	30%
		Lower sec. school	.068	18%
		Upper sec. school	.083	14%
		Academic studies	.092	11%
1974	0.0047	Vocational school	.048	42%
		Lower sec. school	.081	24%
		Upper sec. school	.100	18%
		Academic studies	.111	15%
1978	0.0033	Vocational school	.032	33%
		Lower sec. school	.057	20%
		Upper sec. school	.070	15%
		Academic studies	.079	10%
1982	0.0037	Vocational school	.038	36%
		Lower sec. school	.065	22%
		Upper sec. school	.083	18%
		Academic studies	.095	12%
1986	0.0034	Vocational school	.030	31%
		Lower sec. school	.055	19%
		Upper sec. school	.072	18%
		Academic studies	.082	12%
1990	0.0041	Vocational school	.037	28%
		Lower sec. school	.066	22%
		Upper sec. school	.085	18%
		Academic studies	.098	13%
1993	0.0032	Vocational school	.029	28%
		Lower sec. school	.055	14%
		Upper sec. school	.070	13%
		Academic studies	.079	11%

A proportional bias consistently larger for the lower levels of education was a surprising result to begin with. In other words, the premium for vocational school compared with discontinued or fulfilled primary school was more biased than the premium for an academic education compared with discontinued or fulfilled primary school. However, it must be remembered that the individuals who went all the way through an academic education were a chosen few. Very many adolescents with the potential to go through both upper secondary school and an academic education did not go further than vocational or lower secondary school, or even primary school. Hence, the variation in ability among the less educated should therefore be greater than among the highly educated. This also appears to be the case. In Table 4. the standard deviation and coefficient of variation is shown among the different educational levels.

Table 4.
Distribution of ability among the educational levels
***n* = 752**

Educational level	Standard deviation	Coefficient of variation
Primary school	14.82	16.57
Vocational school	14.65	14.76
Lower secondary school	12.08	11.26
Upper secondary school	11.27	10.15
Academic education	11.62	10.29

With the exception of the two highest educational levels, the expected pattern is found. The spread of ability is highest among the least educated, and smallest among those with upper secondary school. Hence, it might be the case that since the variation of ability is higher in the bigger group of less educated men, it has a greater significance for the wage premium if ability is omitted in this group, compared to the two educational groups where the individuals are more of the same ability.

VI – Discussion

I have used the longitudinal data of the Malmö Study to analyse different aspects of earnings and education. First, a description of the earnings development over the working-life is presented. Regarding the men, a picture fairly similar to that given by Mincer (1974) on U.S. data evolves, but the peak is reached earlier. Mincer's curves are also much steeper than those calculated on the Malmö material, and the decrease in earnings for the highly educated is smaller.

Comparing the actual figures I use, with those calculated on cross-sectional data, it must be remembered that the actual development is also affected by institutional, structural and personal changes over a person's lifecycle. For example, the compression of wages shown among these men during the seventies and eighties may have been caused by the active wage equalisation policy during this time. It may also have been caused by high unemployment among the men, which would have reduced their real earnings. Still, only two men reported themselves unemployed during the seventies, and three in the eighties. Neither was there any high unemployment in Sweden during this period (Ohlsson & Olofsson, 1998). However, inflation was high which may have affected the real values of earnings. My belief is that the actual decrease in real earnings among the highly educated men was partly caused by the active wage policy, and partly by the high inflation. Another part of the explanation is perhaps the fact that most of the academically educated men were employed in the public sector, which had a worse development than the private sector.

It is interesting to note that while the wage equalisation often is expected to have decreased the wage dispersion by increasing the wages for the low-income earners, my results give another picture. The decrease in earnings dispersion seem to have come around from above, by reduced earnings of the high-income earners.

The decrease in earnings between 1990 and 1993 was probably caused by the fact that most of the men were retired by then. The much steeper decrease for the academically educated, i.e. those with the highest incomes, might be an illustration of the retirement scheme. The pension is to start with a percentage of the individual's earlier earnings. However, there is also a maximum amount that the individual can receive as a pension. Therefore, men with higher incomes naturally received a lesser percentage of their earlier earnings than those with lower earnings.

I estimated the wage premium on twelve occasions during these men's lives. The wage premium followed a development similar to the real wages, but with a somewhat larger spread between the educational levels. Thus, even the premiums decreased during the late seventies and early eighties for the two highest educated groups of men. This has been shown in other Swedish studies (Björklund, 1999; Edin & Holmlund, 1995; Björklund & Kjellström, 2002; Zetterberg, 1994), but is still a little surprising since the data in this case involves a cohort, while the mentioned studies use cross-sectional data. The individuals in the cohort evidently receive lower premiums for their educational levels as time progresses.

The lack of significance for the experience coefficients may have been caused by the fact that the men are more or less of the same age and therefore have very similar degrees of work-experience. It is however difficult to verify this and I refrain from further discussion on the subject.

It is noteworthy that even the premiums for the men with upper secondary school fluctuate over the working life. According to other studies, Swedish and international, primarily the premium for the academically educated persons has changed considerably over the years (Edin & Holmlund, 1993; Blackburn & Neumark, 1991). However, among the individuals I have studied, even upper secondary school must be considered as a high education, but fifteen per cent of them had such an exam.

For the last years I also controlled for retirement by adding a dummy for this. With the exception of the last year (1993), the dummy coefficients are highly significant, with very high negative estimates the first year in question (1982), and then lower with each year. This seems logical; the individuals who received pensions long before the actual retirement age naturally experienced negative effects on their earnings because of this. As more men in the cohort retired, this effect became less strong, and for the last year it is not even significant. However, the inclusion of a dummy for retirement does not affect the estimates significantly; they are altered a little, in varying directions.

The large and significant difference between the premiums for vocational school and lower secondary school is interesting. These educational levels consist of more or less the same number of years in the educational system, though of different kind; vocational school being just that, and lower secondary of more theoretical character. Number of years of formal schooling is often used instead of levels in the analysis of wage equations, and these results are thus an illustration of how misleading such a measure can be. This large difference in the coefficients is probably caused by differences in the kind of work. Men who went through vocational school may have ended up in fairly low-paid blue-collar jobs, while those who went through lower secondary school instead got employed in better-paid white-collar work. Part of the explanation for this can of course be the selection effect. However, even when I control for both social class and ability, this prominent difference between the premiums for the levels is evident.

Finally I introduced an ability measure in the model. With the exception of the first two years, the ability coefficient is highly significant and with estimates between 0,002 and 0,005 – which is quite similar to ability estimates found in other studies. Furthermore, even if the absolute bias always is higher for the groups with higher education, the proportional bias is consistently higher for those with lower education. That is, the proportional bias for those with only a vocational education is for every year much higher than for those with upper secondary school or academic education. It was also found that the spread of ability was higher within these lower educational groups, which may be the reason for the higher role of ability among them.

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APPENDIX

In all tables, White heteroskedastic-consistent standard errors are given in parentheses, and significance is shown with help of stars, as follows:

* 10% significance

** 5% significance

*** 2.5% significance

In Table T2., Equation 1 is the original model, and Equation 3 the one including ability.

TABLE T1: Wage premiums for all men – equation 1

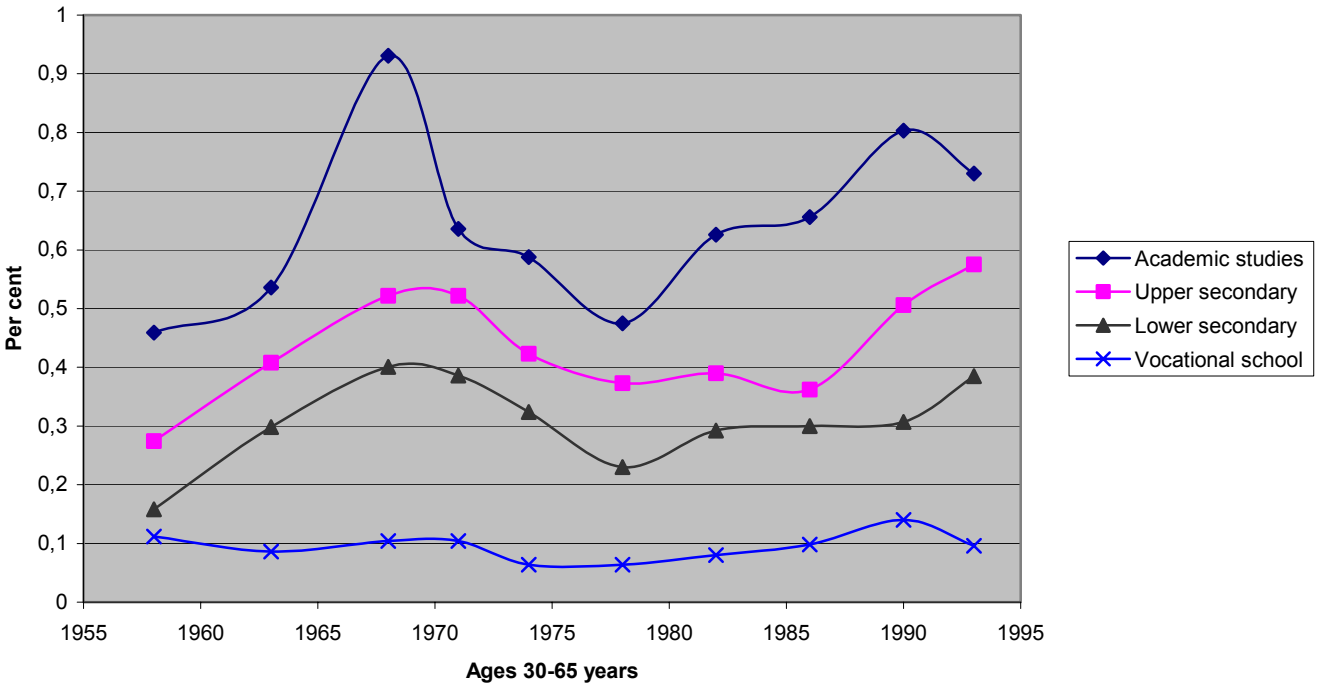
	1948	1953	1958	1963	1968	1971	1974	1978	1982	1986	1990	1993
Educational level:												
Vocational school	0.059 (.055)	0.063** (.285)	0.094*** (.027)	0.081*** (.029)	0.153*** (.034)	0.131*** (.030)	0.113*** (.031)	0.096*** (.031)	0.106*** (.031)	0.096*** (.032)	0.132*** (.041)	0.104*** (.035)
Lower sec. school	0.057 (.088)	0.090 (.063)	0.201*** (.056)	0.221*** (.051)	0.369*** (.047)	0.387*** (.053)	0.340*** (.053)	0.286*** (.053)	0.295*** (.055)	0.295*** (.049)	0.300*** (.058)	0.380*** (.052)
Upper sec. school	0.718 (.490)	0.167 (.119)	0.335*** (.080)	0.377*** (.064)	0.543*** (.056)	0.585*** (.053)	0.542*** (.049)	0.476*** (.059)	0.452*** (.057)	0.393*** (.060)	0.465*** (.073)	0.527*** (.071)
Academic education	0.076 (.299)	0.164 (.217)	0.415*** (.155)	0.530*** (.115)	0.868*** (.083)	0.863*** (.105)	0.762*** (.082)	0.759*** (.087)	0.762*** (.087)	0.678*** (.090)	0.767*** (.096)	0.709*** (.085)
Exp.	-.076 (.136)	-.094 (.059)	0.019 (.058)	0.038 (.027)	0.018* (.010)	-.003 (.008)	0.005 (.009)	-.002 (.009)	0.009 (.007)	0.011 (.007)	0.006 (.008)	-.007 (.007)
Exp^2	0.012 (.011)	0.004 (.003)	-.001 (.002)	-.002* (.001)	-.001* (.000)	0.000 (.000)	-.000 (.000)	0.000 (.000)	-.000 (.000)	-.000 (.000)	0.000 (.000)	-.000 (.000)
Social Class	0.289 (.279)	0.018 (.156)	0.151 (.105)	0.251*** (.073)	0.066 (.067)	0.117* (.067)	0.065 (.057)	0.052 (.057)	0.044 (.064)	0.039 (.063)	0.056 (.076)	0.051 (.065)
N	184	336	445	624	598	663	675	665	641	616	595	565
R2	0.139	0.132	0.247	0.420	0.436	0.431	0.367	0.328	0.317	0.330	0.276	0.284

TABLE T2: Wage premiums with and without ability included (Eqn. 1 and 3)

	1948	1953	1958	1963	1968	1971	1974	1978	1982	1986	1990	1993
IQ	0.002	0.000	0.002***	0.0036***	0.0032***	0.0039***	0.0048***	0.0035***	0.0040***	0.0034***	0.0042***	0.0034***
	(.002)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.000)	(.001)	(.001)	(.001)
Educational level:												
Vocational **Eqn. 1**	0.059	0.063	0.094***	0.081***	0.153***	0.131***	0.113***	0.096***	0.106***	0.096***	0.132***	0.104***
	(.055)	(.285)	(.027)	(.029)	(.034)	(.030)	(.031)	(.031)	(.031)	(.032)	(.041)	(.035)
Eqn. 3	0.045	0.058*	0.078***	0.048	0.123***	0.091***	0.065**	0.064**	0.068**	0.066**	0.095***	0.075***
	(.054)	(.031)	(.029)	(.030)	(.036)	(.031)	(.033)	(.032)	(.040)	(.033)	(.043)	(.036)
Bias %			*17*		*20*	*30*	*42*	*33*	*36*	*31*	*28*	*28*
Lower Sec. **Eqn. 1**	0.057	0.090	0.201***	0.221***	0.369***	0.387***	0.340***	0.286***	0.295***	0.295**	0.300***	0.380***
	(.088)	(.063)	(.056)	(.051)	(.047)	(.053)	(.053)	(.053)	(.055)	(.049)	(.058)	(.052)
Eqn. 3	0.026	0.078	0.170***	0.163***	0.314***	0.319***	0.259***	0.229***	0.230***	0.240***	0.234***	0.325***
	(.088)	(.071)	(.058)	(.052)	(.050)	(.056)	(.055)	(.054)	(.000)	(.049)	(.059)	(.053)
Bias %			*15*	*26*	*15*	*18*	*24*	*20*	*22*	*19*	*22*	*14*
Upper Sec. E**qn. 1**	0.718***	0.167*	0.335***	0.377***	0.543***	0.585***	0.542***	0.476***	0.452***	0.393***	0.465***	0.527***
	(.490)	(.119)	(.080)	(.064)	(.056)	(.053)	(.049)	(.059)	(.057)	(.060)	(.073)	(.071)
Eqn. 3	0.688***	0.155	0.300***	0.306***	0.476***	0.502***	0.442***	0.406***	0.369***	0.321***	0.380***	0.457***
	(.486)	(.123)	(.081)	(.065)	(.059)	(.057)	(.053)	(.062)	(.000)	(.062)	(.077)	(.073)
Bias %	*4*	*7*	*10*	*23*	*12*	*14*	*18*	*15*	*18*	*18*	*18*	*13*
Academic **Eqn. 1**	0.076	0.164	0.415***	0.530***	0.868***	0.863***	0.762***	0.759***	0.762***	0.678***	0.767***	0.709***
	(.299)	(.217)	(.155)	(.115)	(.083)	(.105)	(.082)	(.087)	(.087)	(.090)	(.096)	(.085)
Eqn. 3	0.033	0.152	0.373***	0.445***	0.790***	0.771***	0.651***	0.680***	0.667***	0.596***	0.669***	0.630***
	(.300)	(.219)	(.155)	(.117)	(.085)	(.109)	(.089)	(.088)	(.000)	(.095)	(.102)	(.089)
Bias %			*10*	*16*	*9*	*11*	*15*	*10*	*12*	*12*	*13*	*11*
N	184	336	445	606	598	663	675	665	641	616	595	565
R2												
Eqn. 1	0.139	0.132	0.247	0.420	0.436	0.431	0.367	0.328	0.317	0.322	0.265	0.283
Eqn. 3	0.143	0.132	0.255	0.434	0.446	0.445	0.389	0.339	0.333	0.341	0.289	0.297

APPENDIX

Figure F1: Eqn. 1 - same men each year (N=338)



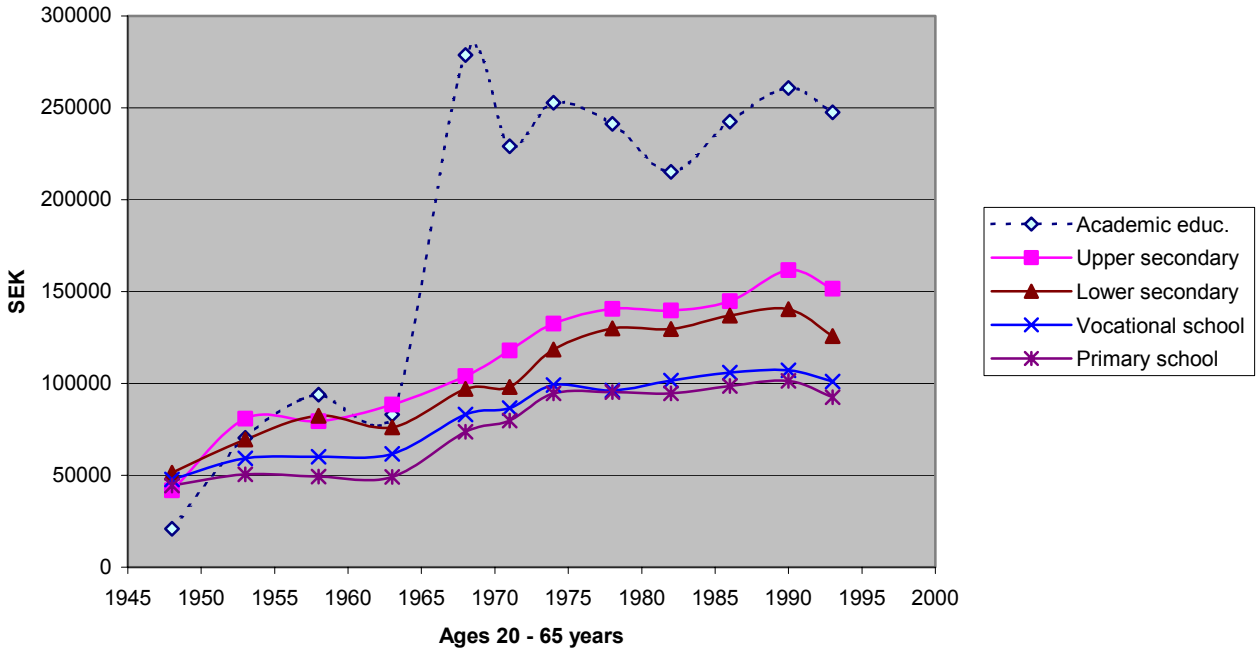
APPENDIX

I find it interesting to see how also the women's actual earnings developed during the seventies and eighties, even if I cannot but speculate about the causes, and have therefore chosen to give a figure and short comment in Appendix. Below are the women's profiles for each level of education.

Regarding the upper curve for the women, belonging to the academically educated, it must be interpreted with caution. For people in Sweden of the cohort's age, academic education is rather rare, and even more so for the women. This curve includes at most fourteen women, and for one year only four.

Among the women only the highest educated have experienced a decrease in real earnings. However, as mentioned earlier, this group consists of only a few individuals. For the other educational groups among the women it is interesting to note that their real earnings hardly dropped at all during the late seventies and early eighties. On the contrary, the women's peaks were not reached until 1990, when the normal-aged women were 62 years old. Hence, the women's real income did not decrease in the early eighties as the men's did. The active wage policy could be part of the explanation, since the women in general were low-income earners. However, the most likely reason is an increase in working-hours.

Figure F2. Age-earnings profiles - women - 1993 years value



APPENDIX

F3. Age-earning profiles, all men inclusive 'outliers'